



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

We have the equation

$$(P - p) \left[ 1 + \frac{r}{4} \right]^3 - p \left[ 1 + \frac{r}{4} \right]^2 - p \left[ 1 + \frac{r}{4} \right] - p = 0.$$

Putting

$$1 + \frac{r}{4} = x$$

and substituting value of  $P$ , we have the equation

$$294x^3 - 106x^2 - 106x - 106 = 0.$$

Solving by Horner's Method, we have

$$x = 1 + \frac{r}{4} = 1.04028,$$

$$r = .16112 = 16.112 \text{ per cent compounded quarterly.}$$

B (by arithmetic). A more elementary and more "practical" method is the method by trial and error. A few trials will show that the rate is something over 16 per cent.

*First Trial.* Taking the rate as 16 per cent and the annual premium as 100, we have the scheme,—

Annual premium due.....	100.00
First quarterly premium paid.....	26.50
	<hr/>
	73.50
Interest for three months.....	2.94
	<hr/>
	76.44
Second quarterly premium paid.....	26.50
	<hr/>
	49.94
Interest for 3 months.....	2.00
	<hr/>
	51.94
Third quarterly premium paid.....	26.50
	<hr/>
	25.44
Interest for 3 months.....	1.02
	<hr/>
	26.46
Fourth quarterly premium.....	26.50
	<hr/>
First error.....	0.04

We see that 16 per cent is slightly too small.

*Second trial.* Taking the rate as 16.2 per cent., we have, in the same way as before, an error of + .03.

Forming a table

Rate	Error
16	-.04
16.2	+.03

By interpolation, the rate that will give zero error is

$$16 + \frac{4}{7} \times .2 = 16.114 \text{ per cent.}$$

If greater accuracy were required, repeat the computation with the last rate and interpolate again.

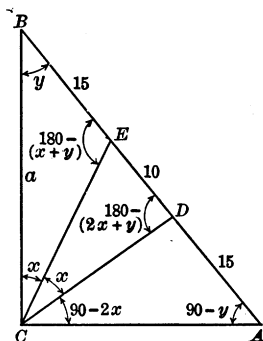
Also solved by G. N. ARMSTRONG, H. N. CARLETON, and H. L. OLSON.

**2747 [1919, 72]. Proposed by DANIEL KRETH, Wellman, Iowa.**

In the right triangle  $ABC$ , right angle  $C$ , we have given on the hypotenuse the segments  $AD = 15$ ,  $DE = 10$ ,  $EB = 15$ , and the angle  $DCE$  equal to the angle  $ECB$ . Find the angle  $DCE$ , and the sides  $AC$  and  $BC$ .

## SOLUTION BY MARCIA LATHAM, New York City.

Let  $BC = a$ ,  $AC = b$ ,  $DC = c$ ,  $\angle DCE = \angle ECB = x$ ,  $\angle ABC = y$ . Then  $\angle DCA = 90 - 2x$ ,  $\angle EDC = 180 - (2x + y)$ , and  $\angle BEC = 180 - (x + y)$ .



$$\sin y = b/40 \quad \text{and} \quad \cos y = a/40. \quad (1)$$

Since  $EC$  bisects  $\angle BCD$ ,

$$a/c = 15/10 = 3/2. \quad (2)$$

In the triangle,  $DCA$ , by the law of sines,

$$c/15 = \cos y / \cos 2x. \quad (3)$$

Combining (1), (2), and (3),  $2a/45 = a/40 \cos 2x$ , or  $\cos 2x = 9/16$ ,  $x = 1/2 \cos^{-1} 9/16 = 27^\circ 53' 8''$ . In the triangle,  $BCD$ , by law of sines,  $\sin (2x + y)/\sin y = a/c$ . Whence, by (1) and (2)

$$\sin (2x + y) = 3b/80. \quad (4)$$

Also,  $a/25 = \sin (2x + y)/\sin 2x$ ; whence, by (4),  $\sin 2x = 15b/16a$ . But  $\sin^2 2x + \cos^2 2x = 1$ . Then  $(15b/16a)^2 + (9/16)^2 = 1$ ; whence

$$b^2 = 7a^2/9. \quad (5)$$

Now, in the triangle,  $ABC$ ,  $a^2 + b^2 = (40)^2$ ; whence, by (5),  $a^2 + 7a^2/9 = 1,600$ ; whence,  $a = 30$  and from (5),  $b = 10\sqrt{7}$ .

Also solved by A. M. HARDING, POLYCARP HANSEN, C. E. HORNE, R. A. JOHNSON, ELMER LATSHAW, E. W. MARTIN, LOUIS ORDANKSY, A. PELLETIER, J. L. RILEY, H. M. ROESER, L. SMITH, D. L. STAMY, H. TSAI, and L. G. WELD.

**2760 [1919, 124].** Proposed by CHARLES N. SCHMALL, New York City.

In an arithmetical progression, if  $s_n$  be the sum of the first  $n$  terms,  $s_{2n}$  the sum of the first  $2n$  terms, and  $s_{3n}$  the sum of the first  $3n$  terms of the same series, prove that  $s_{2n} - s_n = \frac{1}{3}s_{3n}$ .

## SOLUTION BY EMMA M. GIBSON, Springfield (Mo.) High School.

The sum of  $n$  terms of an arithmetical progression is expressed by the formula

$$s_n = \frac{n(a_1 + a_n)}{2},$$

where  $a_1$  and  $a_n$  are the first and  $n$ th terms, respectively.

Hence,  $s_n = n(a_1 + a_n)/2$ ,  $s_{2n} = 2n(a_1 + a_{2n})/2$ , and  $s_{3n} = 3n(a_1 + a_{3n})/2$  are the sums of the first  $n$  terms, the first  $2n$  terms, and the first  $3n$  terms, respectively. Now  $a_{2n} = a_n + nd$ ,  $a_{3n} = a_{2n} + nd = a_n + 2nd$ ,  $d$  being the common difference.

Then  $s_{2n} = 2n(a_1 + a_n + nd)/2$  and  $s_{3n} = 3n(a_1 + a_n + 2nd)/2$  and

$$s_{2n} - s_n = 2n(a_1 + a_n + nd)/2 - n(a_1 + a_n)/2 = n(a_1 + a_n + 2nd)/2 = s_{3n}/3.$$

Also solved by R. D. BOHANNAN, H. L. BRIDGES, JR., H. N. CARLETON, W. F. CHENEY, JR., P. J. DA CUNHA, H. C. GOSSARD, WILLIAM HERBERG, C. N. MILLS, LOUIS O'SHAUGHNESSEY, H. L. OLSON, A. PELLETIER, J. B. REYNOLDS, I. S. SUN, and ELIJAH SWIFT.

**2768 [1919, 171].** Proposed by PAUL CAPRON, U. S. Naval Academy.

Given the center, a focus, and a point of a conic, construct geometrically the circle of curvature at the point.